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**United States Patent**

[19]

Surjaatmadja et al.

[11] **Patent Number:** **5,533,571**[45] **Date of Patent:** **Jul. 9, 1996**[54] **SURFACE SWITCHABLE  
DOWN-JET/SIDE-JET APPARATUS**

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[52] U.S. Cl. 166/222; 166/318

[58] Field of Search 166/222, 223, 166/318, 332, 317; 175/237, 331, 317

[56] **References Cited**

## U.S. PATENT DOCUMENTS

1,279,333	9/1918	Green	.....	166/222
2,828,107	3/1958	Bobo	175/237 X	
3,066,735	12/1962	Zingg	166/318 X	
3,116,800	1/1964	Kammerer	166/222 X	
3,145,776	8/1964	Pittman	166/55	
3,795,282	3/1974	Oliver	175/237 X	
3,892,274	7/1975	Dull	166/222	
3,958,641	5/1976	Dill et al.	166/312	
4,346,761	8/1982	Skinner et al.	166/206	
4,518,041	5/1985	Zublin	166/222 X	
4,625,799	12/1986	McCormick et al.	166/223	
4,705,107	11/1987	Council et al.	166/170	
4,744,420	5/1988	Patterson et al.	166/312	
4,781,250	11/1988	McCormick et al.	166/240	
4,818,197	4/1989	Mueller	418/48	
4,967,841	11/1990	Murray	166/222 X	
5,029,644	7/1991	Szarka et al.	166/223	

5,097,902 3/1992 Clark ....., 166/187

## OTHER PUBLICATIONS

Otis Engineering Corporation Brochure entitled "Break Down Buildups—And Restore Production With Hydra-Blast® Services" (1988).

Paper entitled "Principles of Hydraulic Jet Cleaning" dated Jul 2, 1987.

Catalog of Stoneage Waterjet Engineering (Undated but admitted to be prior art).

Halliburton Services Catalog Excerpt Section 6: Wellbore Cleanout (Jan., 1993).

Otis Engineering Corporation Products and Services Brochure (1989), p. 283.

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[57] **ABSTRACT**

A surface switchable down-jet/side-jet apparatus. The apparatus comprises a housing with a valve sleeve slidably disposed therein. When the valve sleeve is in a first position, fluid pumped into the apparatus will be jetted out of at least one longitudinally directed port. An actuator, such as a ball, is dropped into the apparatus to seat on the valve sleeve, and when pressure is applied thereto, forces the valve sleeve downwardly, shearing a shear pin. The valve sleeve is moved downwardly to a second position in which at least one transverse port in the housing is uncovered and the longitudinal port is closed. Additional fluid pumped into the apparatus is jetted radially outwardly through the transverse port.

**6 Claims, 2 Drawing Sheets**

